

Effect of 11-Year Solar Flux Variation on Ozone and Other Trace
Constituents Before and During the UARS Period

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Trend analysis of satellite and ground-based observations clearly indicate that temperatures and ozone concentrations in the stratosphere are undergoing long-term changes. Variations in solar ultraviolet radiation during the 11-year solar cycle are influencing stratospheric temperatures and photochemistry from above. Forcings from below result from the increasing atmospheric concentrations of long-lived trace constituents, such as carbon dioxide, methane, nitrous oxide, several chlorofluorocarbons and other halocarbons. Using the LLNL two-dimensional chemical-radiative-transport model of the global atmosphere, we evaluate the influences of these external forcings on the middle atmosphere between 1975 and present. For the UARS period the Lyman alpha variation from SOLSTICE is used. Solar spectral irradiances at wavelengths greater than 180 nm (wavelength region of stratospheric influence) is also obtained by SOLSTICE. Using the strong correlation between Lyman alpha and the wavelengths greater than 180 nm during the UARS period, the solar minimum/maximum impact of the 11-year solar cycle can be derived for the previous solar cycle. Our calculation include Lyman alpha data from SME (1981-1989) and make use of the high correlation between variations in the Lyman alpha and Helium 1083 nm equivalent line width (1975-1981 and 1989-1991). The impact of Mt. Pinatubo, from both enhanced heterogeneous chemical processing and aerosol mediated heating, on ozone is included in this study. Changes in model-derived and observed trace constituent concentrations using the UARS species instruments will be presented.

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